Medicon Agriculture & Environmental Sciences
Volume 8 Issue 3 March 2025
Article Type: Research Article
ISSN: 2972-2691

Isolation, Identification and Characterization of Some Phytochemicals Present in Cadaba Farinosa Stem Bark Extract

Salaudeen AA[1]*, Dangoggo SM[2], Faruq UZ[2] and Mshelia HE[3]

[1]*Department of Chemistry, Faculty of Science, Abdu Gusau Polytechnic Talata Mafara, Zamfara State, Nigeria*

[2]*Department of Chemistry, Faculty of Science, Usmanu Danfodiyo University Sokoto, Sokoto State, Nigeria*

[3]*Department of Pharmaceutical Sciences, Usmanu Danfodiyo University Sokoto, Sokoto State, Nigeria*

***Corresponding Author:** Salaudeen AA, Department of Chemistry, Faculty of Science, Abdu Gusau Polytechnic Talata Mafara, Zamfara State, Nigeria.

Received: July 31, 2024; **Published:** March 10, 2025

Abstract

Cadaba farinosa leaves are used in Ayurvedic medicine to cleanse snake bites, as well as for fevers, as a laxative to eliminate intestinal parasites, and to cure diabetes (Jefferson et al., 2014).

The powdered sample extraction was carried out according to method described by El-Mohmood (2009). Serial exhaustive extraction was carried out by maceration using solvents of increasing polarity with the aid of separating funnel containing 500 g of the stem bark. The extract was subjected to phytochemical screening in other to identify the various classes of phytochemicals using the methods described by Jarvis, (2020). The screening was done to identify alkaloids, saponins, flavonoids, tannins, phenols, carbohydrate, proteins/ amino acids, triterphenoids/ steroids and anthraquinones.

The result of the phytochemical screening is presented in Table 1. The methanol extracts contain all the phytochemicals screened except anthraquinone.

Keywords: *Cadaba Farinosa*; Phytochemical Screening; Maceration

Introduction

Plants as therapeutic agents were discovered in ancient times and have thrived even in current times (Fred, 2008). Because of the negative effects associated with synthetic pharmaceuticals and the rising cost of effective drugs, herbal remedies are widely used in Japan, China, and the United Kingdom (Chin et al., 2006).

Alkaloids, tannins, flavonoids, saponins, phenolic compounds, and other bioactive antimicrobial components are found in plants (Edeogal et al., 2005). Bioactive substances can be used to treat diseases and infections if they are carefully isolated, purified, and identified.

When used correctly, it can benefit both humans and animals. Knowledge of a plant's chemical constituent is desirable not only for the identification of treatments but also for the discovery of new resources derived from that chemical substance (Sathish et al., 2013). Traditional medicinal plant applications have shifted in a positive way, leading to more sophisticated and advanced modern medications. The type, quality, presentation, and concept of medical preparations have all evolved as a result of various alterations, improvements, complexity, and novel discoveries (Maryum, 2004). The growth of drug-resistant pathogenic bacteria, as well as the need to reduce the adverse effects frequently associated with the use of synthetic antibiotics, has fueled the search for novel therapeu-

tic compounds derived from plants (Fred, 2006). Herbal medicine is the oldest kind of healthcare known to humans, and it has been practiced by people of all cultures throughout history. Folk medicine relies heavily on medicinal plants. They are, in reality, mankind' earliest companions. More than 80% of the world's population, especially in the third world, relies on herbal/traditional plant-based medications for their primary healthcare requirements, according to the WHO. For their therapeutic value, herbal medicines come in a variety of forms. Modern drugs are widely used in industrialized countries. Herbal medicines are made entirely with medicinal herbs. India is abundantly supplied with a diverse range of medicinally significant plants. Plant preparations have traditionally been used as medication sources based on knowledge and beliefs passed down from generation to generation. These plants are commonly utilized as folk remedies or pharmaceutical preparations in modern medicine by people from all walks of life. Medicinal plants have shown to be quite effective in the treatment of both acute and chronic illnesses. Plants, plant parts, and plant exudates with therapeutic characteristics are known as medicinal plants. Plant chemical components are what give plants their therapeutic powers (Rainer and Douglas, 2006).

Natural products are either of periodic origin or come from bacteria, plants, or animals in general (Nakanishi, 2000). Terpenoids, alkaloids, flavonoids, polyketides, amino acids, peptides, proteins, carbohydrates, lipids, nucleic acid bases, ribonucleic acid (RNA), deoxyribonucleic acid (DNA), and so on are examples of natural products as chemicals (Jarvis, 2000). Traditional medicine in Nigeria, Senegal, Ghana, and Sudan, like that of other developing countries, is a unique blend of indigenous cultures with Islamic, Arabic, and African traditions.

Cadaba farinosa forks (Capparaceae), also known as Bagayi in Hausa and Cadaba in India, is found in dry areas all across the world. It is high in minerals and amino acids, making it helpful to both cattle and humans. Animals consume it in large quantities. It's a plant that has been around for a long time. Although it has a wide range of pharmacological activities, as described in 'Ayurveda and Siddha,' an ancient Indian school of medicine, its medicinal potentials are yet to be fully explored. *Cadaba farinosa fork* has a lot of alkaloids, flavonoids, and terpenoids in it (Evans and Williams, 2009). Its antioxidant capabilities against oxidative damage have been studied professionally (Haraguchi, 2001). It also has antithrombotic and vasoprotective qualities, according to studies (Gamdeet al., 2019). *Cadaba farinosa* bio-flavonoids showed considerable cytotoxicity against a panel of malignant cells (Silva et al., 1998). Cadaba farinosa leaves are used in Ayurvedic medicine to cleanse snake bites, as well as for fevers, as a laxative to eliminate intestinal parasites, and to cure diabetes (Jefferson et al., 2014).

Majnooni et al. (2020) investigated the phytochemicals and their potential therapeutic use in the treatment of viral lung damage.

Sharanya (2021) reviewed available literature studies on phytochemicals used as antivirals.

The aim of this paper is to identify and characterize some phytochemicals present in cadaba farinosa stem bark extracts.

Methodology

Extraction of plant sample

The extraction was carried out according to method described by El-Mohmood (2009). Serial exhaustive extraction was carried out by maceration using solvents of increasing polarity with the aid of separating funnel containing 500 g of the stem bark. The stem bark was soaked with 1250 cm^3 of n- Hexane for 24 hours. The resulting extract was collected and concentrated using open air. The residue obtained from above was allowed to dry and then extracted as described above using 1,110 cm^3 of chloroform. The resulting extract was concentrated and the residue was allowed to dry and then extracted using 1,320 of ethyl acetate. The resulting extract was concentrated and the residue obtained was finally extracted using 1,250 cm^3 of methanol. The percentage yields of the extracts were calculated using formula 1 and the extracts stored separately in air tight containers for further use.

$$\%\ yield = \frac{weight\ of\ extract\ obtained}{weight\ of\ sample} \times \frac{100}{1} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (1)$$

Phytochemical Screening of the Crude Extracts and Fractions

The extract was subjected to phytochemical screening in other to identify the various classes of phytochemicals using the methods described by Jarvis, (2020). The screening was done to identify alkaloids, saponins, flavonoids, tannins, phenols, carbohydrate, proteins/ amino acids, triterphenoids/ steroids and anthraquinones.

Test for Alkaloids

Mayer's test

Two drops of Mayer's reagent was added to 3 cm^3 of plant sample extract along the test tube's sidewalls. The presence of alkaloids was indicated by the appearance of white creamy precipitate.

Wagner's test

A few drops of Wagner's reagent were added to 3cm^3 of plant extract. A reddish- Brown precipitate, confirmed the test as positive.

Saponin Test

Frothing test

The extract (50 mg) was diluted in distilled water to make a total volume of 20 ml. In a Stoppard graduated cylinder, the suspension was vigorously shaken. The presence of saponins was indicated by the production of foam that lasted for 30 minutes.

Flavonoid Testing

The extract (0.5 g) was dissolved in 15 cm^3 of 5% ethanol and filtered after that. The filtrate w\as utilized in the next experiment.

$AlCl_3$ (aluminum chloride) test

To 3 cm^3 of the filtrate in the test tube, 1 cm^3 of 1% aluminum chloride solution and methanol was added. Formation of a yellow colour indicated the presence of flavonoids.

KOH (potassium hydroxide) test

To 3 cm^3 of the filtrate in a test tube, 1 cm^3 of potassium hydroxide solution was added. A dark yellow colour indicated the presence of flavonoids compounds.

Shinoda's examination

To 3 cm^3 of filtrate, 0.5 cm^3 of concentrated HCl and a few magnesium turnings (0.5 g) were added. The formation of pink colour indicated the presence of flavonoids.

Tannins and Phenolic Compounds Test

Test for ferric chloride

In 5 cm^3 of distilled water, the extract (0.5 g) was dissolved. A few drops of neutral 5 percent ferric chloride solution were added to this mixture. The presence of phenolic compounds was indicated by a dark green colour.

Lead acetate test

The extract (50 mg) was dissolved in distilled water and to this 3 cm^3 of 10 percent lead acetate solution was added, a bulky white precipitate indicated the presence of phenolic compounds.

Test for Phytosterols

Libermann-Burchard's test

To 2 cm^3 acetic anhydride, the extract (50 mg) was dissolved. 1 to 2 drops of strong sulphuric acid, applied slowly along the sides of the test tube, was added to this. The presence of phytosterols was evidenced by a variety of changes.

Test for Carbohydrates

The Molisch test

To 2 cm^3 of plant sample extract, two drops of alcoholic solution of α- naphthol was added. The mixture was well shaken and few drops of concentrated sulphuric acid was added slowly along the sides of the test tube. A violet ring indicates the presence of carbohydrates.

Benedict's examination

To 0.5 cm^3 of filtrate, 0.5 cm^3 of Benedict‟s reagent was added. The mixture was heated on a boiling water bath for 2 minutes. A characteristic coloured precipitate indicates the presence of sugar.

Test for Amino Acids

The extract (100 mg) was dissolved in 10 cm^3 of distilled water, filtered through Whatmann No. 1 filter paper, and then tested for amino acids.

Test for ninhydrin

To 2 cm^3 of aqueous filtrate, two drops of ninhydrin solution (10 mg ninhydrin in 200 cm^3 acetone) was added. The presence of amino acids was indicated by the presence of purple color.

Test for Proteins

The extract (100 mg) was dissolved in 10 cm^3 of distilled water, filtered using Whatmann No. 1 filter paper, and then tested for proteins.

Millon's test

A few drops of Million's reagent was added to 2 cm^3 of filtrate. The presence of proteins was indicated by a white precipitate.

Xanthoproteic test

In the test solution, 1 cm^3 of concentrated HNO3 was added. The mixture was then heated before being cooled down. The presence of aromatic amino acids was shown by the addition of NaOH until a colour changed from yellow to orange was detected.

Anthraquinone Test

The extract (0.5 g) was filtered after shaking with 10 cm^3 of benzene. The filtrate was treated with 5 cm^3 of 10% ammonia. If there was no noticeable change in colour after shaking the mixture, anthraquinone was not present.

Result

Phytochemical screening results of all analyzed extracts are shown in table 1 below.

S/No	*Phytochemical and Test method*	*N- Hexane*	*Chloroform*	*Ethylacetate*	*Methanol*
1	**Saponins**				
	* Froth/foaming test	-	-	-	++
2	**Carbohydrates**				
	* Molisch's test	-	+	+	++
3	**ReducingSugar**				
	* Fehling's test	-	-	+	++
4	**Alkaloid**				
	* Mayor's teat	-	-	+	+++
5	**Anthraquinones**				
	* Bontrager's test	-	-	ND	ND
6	**Tannins**				
	* Load acetate's test	-	-	+	+
	* Ferric chloride test	-	-	+	+
7	**Flavonoid**				
	* Alkaline test (10% NaOH)	-	-	+	+
8	**Steroid/triterphenoid**				
	*Salkowski's test	+	++	+	++
	*Lieberrrmann-Burchard's test	+	++	+	++
9	**Cardiacglycoside**				
	*Keller-killani's test	++	++	+	+
10	**Diterpenoids**				
	*Copper acetate's test	++	+	+	+
11	**Protein**				
	Millon's test	-	-	+	+
12	**Amino acids**				
	Ninhydrin's test	-	-	+	+

Keys:

+	Trace reaction observed (positive result).	-	No visible
++	Moderate reaction observed (positive result).	ND	Not Detect (negative result)
+++	Higher reaction observed (positive result).		

Table 1: Phytochemical Screening Result of the Four Extracts.

Discussion

The result of the phytochemical screening is presented in Table 1. The methanol extracts contain all the phytochemicals screened except anthraquinone. This is followed by ethyl acetate which does not contain saponins. The n-hexane extract contains steroids, triterphenoids, cardiac glycosides and diterpenoids.

Chloroform extracts are similar to that of n-hexane except the presence of carbohydrate that was absent in n-hexane.

Alkaloids shows higher presence than all the other phytochemicals screened, this is in line with previous phytochemical studies on *cadaba farinosa*.

Table 1 shows the phytochemical result of the extracts which further confirmed the high amount of alkaloid present in *Cadaba farinosa*. The highest number of alkaloids make the plant an interesting lead plant to be investigated for its antiviral activity.

Alkaloid contains one or more nitrogen atoms in their structure, alkaloids are one of the most widespread phytochemicals in plant families such as Amaryllidaceae, Apocynaceae, Papaveraceae, Asteraceae, and Solanaceae possessing potential biological activities and pharmacological effects (Maryum, 2004). Besides, several studies have shown the prominent effects of alkaloids on various types of viruses such as influenza viruses, herpes simplex virus, human immunodeficiency virus, and hepatitis C virus (Chen et al., 2019). Also, previous in vitro and in silico studies have indicated the prominent effects of alkaloids against corona viruses, especially SARS-CoV-2., The virus employs different mechanisms such as inhibition of the main protease (Mpro) and RNA dependent RNA polymerase (RdRp), as well as interaction, alkaloids also play a prominent role in human medical history and are widely used for the treatment of various diseases such as neurological disorders, cancer, metabolic disorder, and infectious diseases (Lyu et al., 2005).

Reference

1. Chin YW., et al. "Drug discovery from natural sources". AAPC J. (E.journal) 8.2 (2006).
2. Drummond R. "Common trees of the central water shed woodland of Zimbabwe". National resources board (1981).
3. Edeogal HO, Okwu DE and Mbacabiel BO. "Phytochemical constituents of some Nigerian medicinal plants". African journal of biotechnology 4.7 (2005): 685-688.
4. El-Mohmood MA. "Antibacterial activity of crude extract of euphorbia hirta against some bacteria associated with enteric infections". Journal of medicinal plants research 3.7 (2009): 498-505.
5. Fred. "Mechanism of antimicrobial resistance in bacteria". The American Journal of Medicine 119 6A (2006): 3-10.
6. Rainer WB and Douglas S. "Traditional medicinal plant use in northern peru: tracking two thousand years of healing culture". Journal of ethno biology and ethno medicine 2 (2006): 47.
7. Jarvis BB. "The role of natural products in evolution". (Evolution of Metabolic pathways): 34 Recent Adv. Phytochem (2000): 1-24.
8. Lambo JO. "The healing power of herbs with special reference to obsteries and gynecology in African medicine". Ife press, Nigeria (1989): 24-27.
9. Rainer WB and Douglas S. "Traditionalmedicinal plant use in northern peru: tracking two thousand years of healing culture". Journal of ethno biology and ethno medicine 2 (2006): 47.
10. Thirupathi K., et al. "A Review of Medicinal Plants of the Genus Cordia: Their chemistry and Pharmacological Uses". Journal of Natural Remedies 8.1 (2008): 1-10.

Volume 8 Issue 3 March 2025